EIGHT CASES OF BERI-BERI.

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ON November 8th information reached me that a number of the crew of the steamship Lanark, lying at Pier 30, Bainbridge Street wharf, were ill, and upon visiting the vessel I found six men of a large Hindoo crew prostrated with symptoms pointing to beri-beri. I found the ship to be a fine large vessel, well appointed and officered, tight, and in good sanitary condition. She loaded at Java five thousand tons of coarse sugar and sailed for Perim, where she arrived twenty days later, having had two deaths aboard during the passage. After leaving Perim she reached Port Saïd in seven days, having had another death on board, and two men, who were then sick, were taken ashore and placed in the hospital, but died before the vessel left Port Saïd, the Lanark being detained there twelve days. After leaving Port Saïd she sailed for Philadelphia, touching at Algiers and Gibraltar; had no more deaths aboard and arrived here November 2, 1893. An examination of the vessel by Drs. Cleaver and Seymour at the State Quarantine Station, proved that she was in good sanitary condition with no apparent serious illness aboard.

The Bill of Inquiry required at the Station reads as follows:

1. What is the name of this vessel? Lanark.
2. What is the rig of the vessel? Steamship.
3. What is the name of the commander? W. B. Cross.
4. From what port did she start on this voyage? Java, Sourabaya.
5. When did she clear this port? August 18, 1893.
6. What is her tonnage? 1973.
7. To what port does she belong? Liverpool, Eng.
8. How many men, all told, compose your crew? 60.
9. How many passengers have you? 5.
10. How many passengers are foreigners? 5.
11. Are all the passengers you have taken on board now on board of your vessel? Yes.
12. Where were the passengers taken on board? Cardiff, Wales.
13. Have you had any sickness on board since the commencement of this voyage? Yes; three died during the voyage, of malarial fever.
14. Are all now on board in good health? Yes.
15. At what port or places did your vessel touch or trade during the voyage, and at what time did she leave each of them? Perim, Sept. 11th; Port Saïd, Egypt, Sept. 31st; Algiers, Oct. 8th; Gibraltar, Spain, Oct. 11th, 1893.
16. Did any sickness prevail in the harbor, or on shore, or at any of said ports or places? None.

17. Of what does your cargo consist? Sugar.

18. To whom is your cargo consigned? Franklin Sugar Refinery.

19. To whom is your vessel consigned? R. R. Sneden.

20. Have you a bill of health? Yes.

21. Has any person boarded your vessel since you entered the Capes? None.

22. Has any person left your vessel since you entered the Capes? None.

23. Have you any rags or waste aboard? None.

Upon closer inquiries I found that the men who died all presented similar symptoms: great weakness and emaciation, paresis of the lower extremities, amounting in two cases almost to paralysis; considerable epigastric distress, some vomiting, and more or less œdema of the legs. The fatal cases all died rather suddenly. None of the cases had chills or fever; they simply became weak, dragged their legs, complained of much epigastric soreness, had considerable palpitation and some shortness of breath, fugitive muscle pains, and more or less dropsy.

On November 9th I visited the vessel again and carefully examined the crew. I found six men presenting marked symptoms of the disease. I immediately ordered the entire crew to be isolated and instructed the ship's officers not to allow any visitors aboard the vessel, nor to allow those engaged in unloading the vessel to come in contact with the crew; for I was informed that shortly after the vessel had reached her dock, two men, too ill to work, were sent by the direction of Dr. Rudderow, physician to the British Consulate, to the Medico Chirurgical Hospital, where one died suddenly.

I confess I was much impressed by the facts as I found them. A disease unknown to me in a practical way, affecting twelve persons, of whom six died, a mortality of 50 per cent., decided me to adopt prompt and effective measures, and I ordered the vessel to be taken on Saturday, November 11th, at 12 o'clock, to Quarantine Station, to be treated, her crew to be removed as suspects, and the sick to be sent to the hospital. Friday evening, November 10th, an interview, attended by Health Officer Veale, Mr. Clipperton (British Consul), Captain Cross, and the Quarantine Physician, resulted in a plan, to which all agreed, to permit the vessel to remain at her dock or in stream, to remove the crew to the Quarantine Station at the expense of the ship's representatives, and to burn the bedding and soiled effects of the crew. I immediately telephoned to Dr. Cleaver to report the next morning on board the Lanark and to direct the proper cleansing of the vessel, the instructions being, to have the vessel mechanically cleansed, then drenched with bichloride 1 to 500, and after this to fumigate for twenty-four hours with sulphur dioxide, burning not less than three pounds to every 1000 cubic feet of space. The bedding and soiled effects of the crew were burned. The work of cleansing the vessel occupied three days. On Saturday afternoon November 11th, thirty-nine of the crew, consisting of firemen, sailors, and stewards, were received at the Station. Of these, eight were found to be sick. They were given a hot bath and then immersed in a 1 to 1000 solution of bichloride, given clean clothes, and sent to the hospital. Thirty-one were housed as suspects in the barracks, but were first given a bath, immersed in a 1 to 1000 bichloride solution, and put into clean clothes. On Sunday, November 12th, I began a careful study of the cases in the hospital.

CASE I.—Mohammed Hafiz, aged thirty-five years, began to feel sick some time in October. He lost flesh, had pains in his body, but was not incapacitated for work until after the vessel had been in port for several days, when his legs began to swell and feel very heavy. His condition on November 12th was as follows: More or less emaciated, weak, and he walked with some effort. His deltoids were sore to the touch and he had considerable muscle soreness through the posterior muscles of the legs. His tongue was very red, beefy; the cardiac area enlarged, both transversely and vertically; rapid but irregular heart action; at the base a well-marked systolic murmur, soft in character, best marked over the tricuspid cartilage. No evidence of pulmonary, hepatic, or splenic involvement. Considerable epigastric tenderness. Cutaneous reflexes absent on the sides of the feet and palms of the hands. Large areas of cutaneous anæsthesia involving the skin of the dorsum of the forearm in both arms, and in the right extending over the shoulder. Entire abdomen below umbilicus anæsthetic. The skin over the dorsum of the foot and anterior and upper lateral surfaces of the leg in both lower extremities insensitive to the prick of a needle or to the application of intense cold or heat. The patellar and ankle reflexes were impaired.

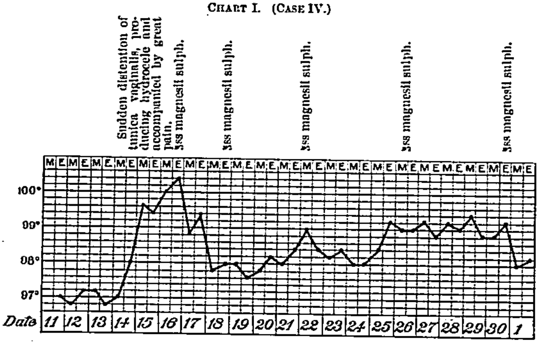
A curious symptom in this case was unilateral sweating. This patient's right arm and the right side of the face were constantly covered with a profuse sweat. An examination of his blood showed a deficiency in the number of red corpuscles, a slight increase in the white; a diminished tendency for the corpuscles to form rouleaux; they seemed to have a tendency to aggregate in scale-like groups, but no foreign elements were observed. The urine showed neither albumin nor sugar, but an abundance of phosphates; it was neutral in reaction and had a specific gravity of 1022. Under treatment this man progressively improved and was discharged, practically well, ten days after admission.

CASE II.—Abdulla Hamed, aged twenty-five years, has been ailing for about two months. Has complained of great weakness in the legs and much soreness of the muscles. He lost flesh rapidly and shows decided atrophy of the anterior muscles of the legs. On admission to the hospital he had a soft systolic murmur, most distinct over the pulmonary artery. He has frequent attacks of palpitation during which the heart rhythm is disturbed. He has considerable epigastric tenderness, some nausea and vomiting, principally of mucus, and occasionally after taking food. No apparent liver or splenic enlargement and but very slight œdema about the malleoli. His urine showed neither albumin nor sugar, and had a specific gravity of 1016. He was hyperæsthetic about the lips and right side of the face; the left side of the face was devoid of sensation. He also presented anæsthetic areas over the anterior and lateral regions of the legs and dorsal surfaces of the feet. His reflexes were well marked, in fact exaggerated. His blood was markedly hydræmic. He was discharged ten days after admission, convalescent.

CASE III.—Sad Bedad, aged forty years; a well-built man. My attention was called to this man on account of the apparent paralysis of the flexor muscles of the feet. I observed that as he walked along the floor he raised his heels very high, dragging his toes. On admission to the hospital he was found to have a well-marked, but soft, systolic murmur transmitted through the tricuspid orifice, but most distinct over the third left intercostal. He had considerable epigastric tenderness; no apparent involvement of the lungs, spleen, or liver; some soreness or tenderness in the right inguinal region, and frequent watery stools. His urine showed neither albumin nor sugar and had a specific gravity of 1026. He had marked dropsy of the legs. There was loss of sensation of the surface of the arms as high as the deltoids, over the præcordia, lower part of abdomen, anterior part of thighs, over the anterior and lateral regions of the legs and the dorsal surface of the feet. He has strongly exaggerated patella and foot reflexes; a tap over the right tendo patellæ produces an almost convulsive response. His blood showed no parasites. He was discharged on November 20, 1893, much improved.

CASE IV.—Saliman Ali, aged twenty-one years, was decidedly weak, his legs were very œdematous, he had much dyspnœa, and presented a double cardiac murmur, irregular heart, pulsating jugulars, throbbing carotids, had diarrhœa, and extensive nerve disturbances. Two days after admission this man exhibited a sudden serous effusion into the tunica vaginalis. He also became anasarcous and very short of breath. A careful physical examination showed some pulmonary œdema, a marked enlargement of the cardiac dulness, irregular ventricular action, a strong but soft mitral murmur, a very well marked tricuspid murmur, a well-defined tremor or thrill over the præcordia, and pulsation of the external jugulars. His neck was somewhat œdematous. He had a cough and occasionally raised some frothy mucus slightly tinged with blood. In

CHART I. (CASE IV.)

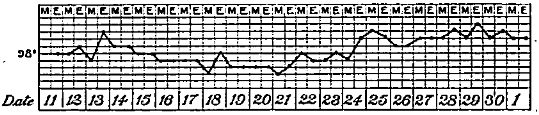


this case there was an entire absence of regularity in the action of the auricles and ventricles; the ventricles contracted independently of each other. The nerve disturbance was marked. There was anæsthesia over the upper lip, the lower lip was hyperæsthetic. The right upper extremity presented small areas of anæsthesia; the skin over the entire left upper extremity was devoid of sensation. There was an entire loss of the tactile sense. The abdomen was hyperæsthetic. The skin along the inner side of the thighs and anterior and outer side of the legs was anæsthetic, but a very deep puncture (half an inch) was felt. There was an entire loss of reflexes, including the cutaneous of the sole and palm. The blood was hydræmic, aplastic, and presented variously sized and shaped corpuscles, but no parasites were observed. (See Chart I.)

Case V.—Seh Mohammed; has been sick for two weeks. On admission his tongue was seen to be covered with small necrotic patches; the intervening areas were very red, beefy, and deeply fissured. He had a soft mitral systolic murmur and complained of much pain over the heart. After a few days' rest in bed, this patient was re-examined and found to have considerable palpitation, shortness of breath, and a blowing systolic murmur most distinct over the third left intercostal space, also a faint diastolic murmur most distinct in the left fifth intercostal space.

On November 16th, when again examined, the heart was acting rhythmically, and presented a murmur heard most distinctly during the ventricular diastole and over the ensiform appendix. Since November 27th all cardiac murmurs have disappeared. There is some epigastric tenderness, great soreness of muscles, and rapid emaciation. He shows slight œdema of the legs and over the sternum. There is some enlargement of the spleen and an antecedent history of malarial disease. The superficial nerve disturbances in this case are curious. On admision I transfixed the lips with a sharp needle without producing any response. The lips and face were profoundly anæsthetic. Six days later exquisite hyperæsthesia developed in these regions. The patient could not tolerate the touch of a spoon to administer his medicine. The skin of the hands and feet is insensitive. This patient can flex the toes, but is obliged to extend them by the hand when ordered to straighten them out. His reflexes are diminished. His blood shows no special changes. The urinary examination was negative. (See Chart II.) Discharged December 2, 1893, apparently well.

Chart II. (Case V.)

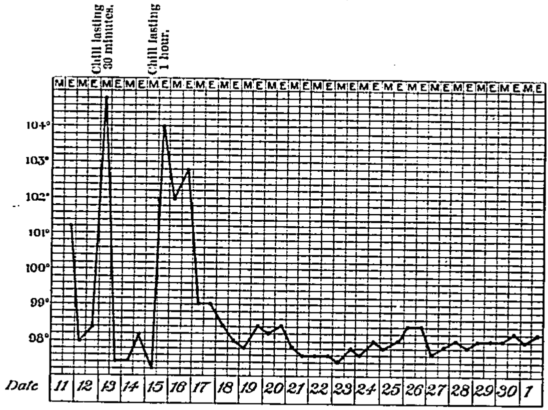


Case VI.—Sala Abdul, aged twenty-five years, a strongly built man, has been sick for a week with pains in his muscles, palpitation, and sudden dropsy of the body. The skin over the trunk and the legs pits readily under pressure. He has a soft systolic murmur most distinct over the aortic cartilage. Has considerable diarrhœa, pain in the head, and aching in the muscles of the calves. He walks in a staggering manner. Has marked enlargement of the spleen, pronounced anæsthesia over the extremities. No antecedent history of malaria. Urine examination negative. The blood does not show any special changes and no crescents. Discharged November 20, 1893, convalescent.

CASE VII.—Mahmood Abdul, aged twenty-four years, has been sick for a month with muscle pains and diarrhœa. On admission was found to be very weak, the muscles of the legs markedly paretic and sore to the touch. There is no œdema, no enlargement of the spleen, a feebly acting dilated heart, and considerable dyspnœa. Patellar and cutaneous reflexes are absent. A soft murmur, most pronounced over the ensiform appendix, and coincident with cardiac diastole. There is a curious blending of anæsthetic and hyperæsthetic areas over the surface of the extremities. The urine shows neither albumin nor sugar. The blood shows no special change. Discharged November 20, 1893, convalescent.

CASE VIII.—Belali Saliman, aged twenty-seven years, has had difficulty in walking since about the middle of September. He is weak and emaciated. Has had chills and fever. His legs are slightly œdematous. Has a very distinct diastolic murmur, soft in character, best heard over the ensiform appendix; has a decidedly large spleen, and slightly enlarged liver. His urine contains a trace of albumin. He has marked abdominal tenderness, nausea, and some vomiting. On the morning of November 13th he had a pronounced chill, which was repeated on November 15th. At the appearance of the first chill we began the free administration of quinine, the effect of which, however, did not become plainly manifested until November 15th or 16th. (See Chart III.) This man exhibited in his blood the hæmatozoon of malaria and also profound changes in the corpuscular elements. His nerve disturbances have been marked. He presented areas of anæsthesia over the extremities,

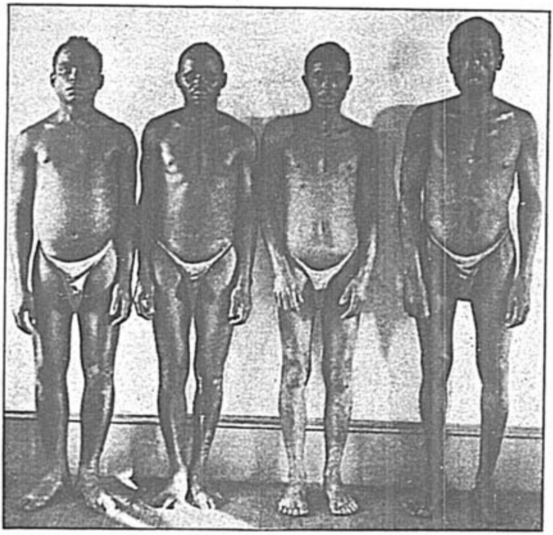
CHART III. (CASE VIII.)



abdomen, and pectoral regions, interspersed with areas of hyperæsthesia. Nor did these remain constant, for the areas of insensibility became, after the lapse of twenty-four to thirty-six hours, hyperæsthetic.

Numerous trials with the battery were made in the cases and all showed, over affected muscles, changes in their electrical reactions.

I herewith present photographs of the patients, some of whom show the lesions of the disease plainly, and I also attach some of the temperature charts.



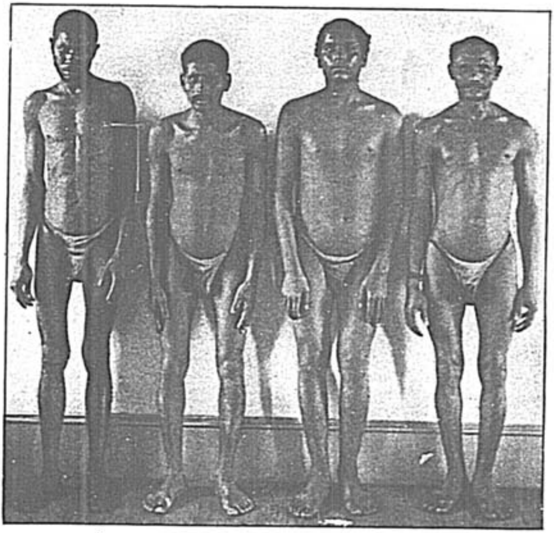
Saliman Ali. Sad Bedad. Abdulla Hamed. Mohammed Hafiz.

The treatment of all these cases was rest in bed between blankets, a full and sufficient diet, to which were added for each man two to three pints of milk per day. The medication consisted of the administration of strychnine, $\frac{1}{50}$ to $\frac{1}{60}$ grain three times a day; infusion of digitalis, $\frac{1}{2}$ ounce three times a day, and the free use of sulphate of magnesia. In Case VIII., owing to the intercurrent tertian intermittent, twenty grains of quinine daily were given, with marked effect on the malarial trouble.

This disease has very infrequently been observed, if ever at all, in

American ports; certainly no such opportunity for investigation and study as we have enjoyed has ever before been met in this country.

The questions which especially interest us as a quarantine body are to determine the probable cause of this disease and its degree of contagiousness. I believe that it is due to a special and specific poison, which produces a profound effect on the sympathetic, especially of the ganglia of the heart. Hence the cardiac disturbances, the nutritive changes, and the rapidly developed serous effusion. I believe the disease to be feebly contagious; of this we have had practical demonstration on the Lanark The two men who died on board on the voyage from Java to Perim undoubtedly brought the disease aboard. The occupant of an adjoining bunk next took the disease, and thus it spread through the vessel's starboard forecastle from bunk to bunk—not in a rapid, but in a slowly progressive manner. Those who occupied the port forecastle escaped infection until near the end of the journey, when one or two became ill; but the firemen of the vessel, who occupied the starboard forecastle, constituted the larger number of those affected. A remarkable fact bearing



Belall Saliman. Mahmood Abdul. Sala Abdul. Seh Mohammed.

on the contagiousness of the disease is the infection of certain Arabs who came on board at Port Saïd. From all accounts, these people were in the best of health at the time they were shipped, but two of them, at least, were among those most profoundly affected with the disease. They were assigned bunks in the starboard forecastle. I would like to add a word about the heart murmurs. They had disappeared in the majority of cases at the time the convalescents left the hospital wards.

As these patients were almost all entirely ignorant of the English language, our study of them presented especial difficulties.

I wish to add that I was most ably assisted in my work in the study of this disease by Drs. Cleaver and Seymour. Dr. Howard S. Anders, of this city, made a series of very careful blood examinations of the patients, and Dr. Judson Daland also made investigations of the blood of Cases IV., V., and VIII. Both reports are of the greatest scientific interest and merit.

Report of Dr. Howard S. Anders on the Blood.

Two of the cases the blood of whom I examined were quite ill of the disease, occupying beds Nos. 4 and 8 (Cases IV. and VIII.) respectively; the third—the occupant of bed No. 7 (Case VII.)—was convalescent.

In the examination, attention was directed particularly to ascertaining the corpuscular richness of the blood, and with a view to discovering any microphytes in the fresh specimen.

At the outset it was remarked, after puncturing the finger-pulp, that the oozing blood (Cases IV. and VIII.) was peculiarly hydræmic in fluidity, though not so in color appearance; in other words, while its redness was fairly good; its plasticity was lacking out of all proportion, the blood from the moment of exit running unusually freely and rapidly in the cutaneous furrows.

The microscopic confirmation of this relatively increased blood diffluence was then observed in the apparent aplastic state of the red copuscles. Instead of joining to form rouleaux, the disks, with few exceptions, tend to place themselves singly, or in groups of twos and threes here and there. This behavior was absent in the blood of the convalescing patient (Case VII.). A count of red corpuscles (Thoma-Zeiss apparatus—480 diameters) showed approximately 3,950,000 per cubic millimetre of blood in Case IV.; there were 4,400,000 red corpuscles per cubic millimetre in Case VIII. On account of the marked fluidity of the blood, I was not able to obtain more than requisite to form a solution of 1 part to 200 of the salt solution.

In Case VII. there was no corpuscular anæmia; the blood was about normal in plasticity, and a 1 per cent. solution was obtained with ease.

There was slight relative leucocytosis in the blood of Cases IV. and VIII. Very moderate hæmoglobinæmia was apparent.

Several micro- and megalocytes were noted in every field. A few poikilocytes were observed; also a point of interest was the finding of the plasmodium malariæ in all three cases. This would seem to indicate a more or less constant prevalence of malarial miasmata in the places inhabited or visited by the sailors.

The hæmatozoa occurred in two forms: the spherical, clear hyaline bodies, and the crescentic bodies—both within the corpuscles. A very few crescents were found in the convalescent case. The transformed hæmoglobin melanin in those corpuscles containing the crescentic organisms assumed a slightly irregular black rod or bacillar appearance at the borders between the organisms and untransformed homogeneous-looking hæmoglobin.

Result of the Examination of the Blood of Three Cases of Beri-beri at the Quarantine Station, Essington, made by Dr. Judson Daland on November 27, 1893.

I. Seh Mohammed (Case V.), aged forty years. The color, consistence, and coagulability of the blood appeared normal as it exuded from the puncture. The red corpuscles were normal in size, but showed no microcytes, megalocytes, or poikilocytes. There was a moderate grade of leucocytosis, and the white corpuscles numbered 30,000 per cubic millimetre. Many of them were remarkable for their gigantic size, and contained large coarse granules, not unlike the eosinophile cells, and the large white corpuscles that are so frequently observed in leukæmia. Blood plaques were present in moderate numbers. Careful search was made for the plasmodium of malaria and other micro-organisms, but none was discovered. The Thoma-Zeiss hæmocytometer was employed in counting the red blood-cells, which numbered 4,750,000, and Fleischl's hæmometer gave 65 per cent. hæmoglobin.

II. Belali Saliman (Case VIII.), aged twenty-one years. The blood, as it exuded from the incision, seemed rather more liquid and paler than normal. Its coagulability was unchanged, but the red corpuscles were of great variety as regards size. A few were larger than normal, and many were only half the diameter of the normal cell. There were a moderate number of microcytes, but there was no tendency to poikilocytosis. There was a moderate grade of leucocytosis, and the white corpuscles numbered about 40,000. They, too, varied in shape, some being as small as microcytes, and many of them were coarsely granular, resembling eosinophile cells. The Thoma-Zeiss hæmocytometer showed that there were 4,400,000 red corpuscles per cubic millimetre, and a careful count of the microcytes showed that there were 400,000 per cubic millimetre. In counting the microcytes all red cells having a diameter of one-half, or less than the normal diameter for red blood-corpuscles, were counted as microcytes. Many of these were mere round points, but their true character was made clear by the color given them by the hæmoglobin present. Fleischl's hæmometer gave 60 per cent. of hæmoglobin. Careful search was made for the plasmodium of malaria, and for other micro-organisms, but none were observed.

III. Saliman Ali (Case IV.), aged twenty years. The blood from the puncture was normal in color, consistence, and coagulability. Microscopically the red blood-cells were normal in size and shape, with the exception of a few microcytes and an occasional megalocyte. To the naked eye the red blood-cells appeared normal in color, though Fleischl's hæmometer showed but 60 per cent. hæmoglobin. The white corpuscles were normal in size, number, and appearance. The Thoma-Zeiss hæmocytometer gives 4,575,000 red corpuscles per cubic millimetre. No plasmodium of malaria, nor other parasitic micro-organisms, were observed.

REMARKS.—It is to be observed in these blood examinations that two or three of the cases showed a moderate grade of leucocytosis, varying from 30,000 to 40,000, and that one of them showed a large number of gigantic leucocytes; two of them showed numerous white corpuscles containing large coarse granules. Case II. is also especially interesting from the extraordinary number of microcytes—that is, 400,000—many of which were remarkable for their minute size. Case III. shows a few microcytes and megalocytes. It is also interesting to note the want of proportion between the number of red corpuscle cells and the amount of hæmoglobin, resembling, in a slight degree, the results obtained in the examination of blood in cases of chlorosis. In each of the three cases the number of red blood-cells was slightly less than normal. This examination of the fresh living blood is also of interest from the absence of parasitic micro-organisms, though careful search was made in the hope of finding the plasmodium of malaria, or some like parasite, or some other form of low animal life. These microscopic examinations were conducted with the aid of the Zeiss microscope, using the apochromatic ocular No. 6, and the apochromatic oil-immersion objective $\frac{1}{12}$.

This incident was the sole unique and novel manifestation of the microscopic investigation, and the only feature carrying with it the suspicion of a possible etiological relation to this interesting endemic disease of Asiatic climes, beri-beri. Further than the above results there were no evidences of any blood parasites whatever.

On the morning of December 23d, in compliance with instructions received from the British Consul, Mr. Clipperton, the two patients detained at the Quarantine Station were delivered to the Medico-Chirurgical Hospital. As the question was raised at our last meeting by Dr. Lee, whether there was any possibility of the existence of trichinosis in these cases, a careful examination was made of the muscular fibres, with negative results. The fibres were, however, found to be granular. Examination of the blood of the patients by Dr. Dixon was likewise negative.

I have the pleasure to report that all of these cases made a good recovery, although the prognosis in at least two was very doubtful. A clinical fact of much interest was the disappearance of the symptoms and signs of the cardiac lesions. At the time of the discharge of the patients the heart in each case showed no evidence of the apparently serious lesions present during the course of the disease.

THE CULTIVATION OF THE TETANUS BACILLUS.

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It is generally conceded that the tetanus bacillus is one of the most difficult organisms to cultivate; not because it is strictly anaërobic, nor because it does not readily develop upon the usual culture media, but rather, perhaps, because it is always associated with other organisms from which it is no easy matter to isolate it. The usual method of separating a given organism from a mixed culture, namely, the plate-culture method, is also recommended for obtaining pure cultures of the tetanus bacillus; but although it may be a simple matter to plate this organism, the writer has never succeeded, in spite of many attempts.

Kitasato's method ("Ueber den Tetanus Bacillus," *Zeit. für Hygiene*, Bd. vii.) of obtaining pure cultures of tetanus bacilli is as follows: The pus from the wound in cases of traumatic tetanus is spread over the surface of blood-serum or agar-agar, and the tubes are then placed in the thermostat at 37° C. Within twenty-four hours the organisms contained in the pus begin to develop, and microscopic examination reveals, among the other bacteria, a few tetanus bacilli containing end-spores. After forty-eight hours tetanus bacilli with spores are very numerous. Such a mixed culture is now placed in a water-bath, previously heated to 80° C., for three-quarters to one hour, which suffices to kill everything but the tetanus spores. Plate cultures are now made in special plating vessels, and these filled with hydrogen. In about ten days recognizable tetanus colonies have developed. Such colonies are described as resembling those of the bacillus subtilis; liquefaction occurs much slower, however, so that later this resemblance is lost. From these colonies pure cultures may be made by any of the anaërobic methods.

The method of Vaillard and Vincent consists in inoculating bouillon tubes with the pus, closing them from the air and keeping them at a temperature of 38° to 39° C. for from five to six days. These tubes, then containing many spore-bearing tetanus bacilli, besides other organisms, are heated for one or two minutes in a water-bath at 100° C., and plates or anaërobic cultures made. I have tried this method several times, but never with success; the spores seem to be always destroyed.

The first case of traumatic tetanus that I had the opportunity of examining bacteriologically was that of a dog[1] which died at the Royal

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[1] It may be interesting to note here that the dog seems to possess almost complete natural immunity from tetanus. Möller observed only one case of general tetanus in fifty thousand sick dogs. In a like number Friedberger and Fröhner have never seen a case. Friedberger and Fröhner: Pathologie und Therapie der Hausthiere, Bd. ii. S. 636.